

# **Guidelines**

## **for Polychlorinated Biphenyls**

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**Environmental  
Protection  
Department**

**July 1995**

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**July 1995**

**Approved by the ES&H Working Group**



Date

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**Robert W. Kuckuck**  
**Deputy Director for Operations**



# Contents

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<b>Introduction .....</b>	<b>1</b>
<b>Background.....</b>	<b>1</b>
<b>PCB Classifications .....</b>	<b>2</b>
<b>Identifying PCB Materials.....</b>	<b>2</b>
<b>Where PCBs Are Found .....</b>	<b>2</b>
<b>Labeling and Handling PCBs.....</b>	<b>4</b>
Labeling Requirements .....	4
Handling Unidentified Equipment .....	5
Handling PCB Equipment.....	5
Avoiding Radioactive Contamination of PCB Equipment .....	5
<b>Inspecting PCB Equipment .....</b>	<b>5</b>
<b>Spill Response .....</b>	<b>6</b>
<b>Disposing of PCB Materials .....</b>	<b>6</b>
<b>Other PCB Uses .....</b>	<b>7</b>
PCB Research and Development .....	7
Inadvertent Generation of PCBs .....	7
<b>Recordkeeping Requirements .....</b>	<b>7</b>
<b>Further Assistance on PCB Handling .....</b>	<b>7</b>
<b>Glossary of PCB Terminology .....</b>	<b>G-1</b>
<b>Acronyms .....</b>	<b>AC-1</b>
<b>References .....</b>	<b>R-1</b>
<b>Appendix A. Specific Requirements for PCB and PCB-Contaminated Equipment.....</b>	<b>A-1</b>
Transformers .....	A-1
Capacitors .....	A-1
Electrical Light Ballasts.....	A-2
Electromagnets, Switches, and Voltage Regulators .....	A-2
Other PCB Equipment .....	A-2

**Appendix B. PCB Recordkeeping and Reporting**.....B-1

    Annual Records.....B-1

    Annual Document Log.....B-1

    Report of PCB Manufacturing Process.....B-2

    PCB Waste Manifest Exception Reports.....B-2

    Notification of PCB Waste Activity.....B-3

    PCB Spill Cleanup Records.....B-3

    Equipment Inspection Logs.....B-3

**Appendix C. PCB Spill Cleanup and Reporting Requirements (40 CFR 761.120-135)**.....C-1

**Appendix D. Waste PCB Packaging, Labeling, and Storage (40 CFR 761.65)**.....D-1

    Packaging.....D-1

    PCB Labeling.....D-1

    PCB Storage in Waste Accumulation Areas.....D-1

    One-Year Storage Requirements.....D-2

**Appendix E. PCB Disposal (40 CFR 761.60)**.....E-1

    PCB Material Mixed with RCRA Hazardous Waste.....E-2

    PCB Material Mixed with Radioactive Waste.....E-2

**Figures**

---

Figure 1. PCB Identification Chart Based on Regulatory Definitions in TSCA (40 CFR 761) .....3

Figure 2. Standard PCB Label.....4

Figure 3. 1-in. × 2-in. PCB Label.....4

**Tables**

---

Table 1. Inspection Frequency .....6

Table B-1. Recordkeeping and Reporting.....B-1

Table C-1. PCB Spill Notification Requirements for EPD.....C-2

Table E-1. Disposal Methods for Bulk PCBs.....E-1

Table E-2. Disposal Methods for PCB Articles.....E-2

# Guidelines for Polychlorinated Biphenyls

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## Introduction

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Polychlorinated biphenyls (PCBs) are a subset of the synthetic organic chemicals known as chlorinated hydrocarbons. PCBs are extremely persistent when released into the environment because they resist metabolic processes that would break them down to simpler chemical compounds. Their low water solubility allows PCBs to accumulate in the fatty tissues of exposed animals and humans. PCBs are known to cause chronic reproductive effects, gastric disorders, and skin lesions in laboratory animals. In addition, the U. S. Environmental Protection Agency (EPA) suspects that PCBs are probable human carcinogens.

In an effort to minimize the potential for adverse health effects caused by PCBs and other substances, Congress passed the Toxic Substances Control Act

(TSCA), which strictly regulates all aspects of PCB use. TSCA also regulates PCBs produced inadvertently as byproducts and impurities. The state of California has enacted additional regulatory requirements that apply in the event of a spill involving PCBs or when PCBs are a waste under California's Hazardous Waste Control Law.<sup>1</sup>

This document provides guidance on:

- Identifying, labeling, and handling PCB and PCB-contaminated materials at Lawrence Livermore National Laboratory (LLNL)
- Responding to PCB spills
- Disposing of PCBs
- Using PCBs in research programs
- Keeping records on PCB and PCB-contaminated materials.

## Background

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Between 1926 and 1977, PCB-containing products were manufactured for use in applications where stable, fire-resistant, heat-transfer properties were demanded. The most extensive use of PCBs occurred in dielectric fluids. Such fluids typically have the following characteristics: a heavy oil appearance, high boiling point, high chemical stability, high flash point, low electrical conductivity, and low water solubility. PCBs were also used as plasticizers and additives in lubricating and cutting fluids.

During the 1970s, federal legislation<sup>2</sup> mandated the elimination of PCBs from distribution in commerce; however, the use of PCBs in existing equipment was, for economic reasons, allowed to continue for the useful<sup>3</sup> or normal life of the equipment as long as specific conditions were met.

<sup>1</sup> California Health and Safety Code, Division 20, Chapter 6.5, Hazardous Waste Control Law.

<sup>2</sup> Toxic Substances Control Act (TSCA) of 1976 (amended by PL-97-129, December 29, 1981; PL 98-80, August 23, 1983; PL 98-620, November 8, 1984; PL 99-519, October 22, 1986; PL 100-368, July 18, 1988).

<sup>3</sup> Useful means natural life, without rebuilding to prolong that life.

## PCB Classifications

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PCB-containing materials are classified according to the concentration of PCBs present. There are three classifications of PCB-containing materials:

- |   |            |
|---|------------|
| • PCB   | ≥500 ppm   |
| • PCB-contaminated                                    | 5–500 ppm  |
| – TSCA-regulated                                      | 50–500 ppm |
| – California-regulated (liquid or waste extract only) | 5–50 ppm   |
| • Non-PCB   | <5 ppm.    |

Mixtures of PCB-containing materials are subject to all requirements of the highest PCB concentration classification within the mixture. The deliberate dilution of PCB materials to reduce the concentration of PCBs in a resultant mixture is prohibited.

**CAUTION:** Federal and state regulations may differ on PCB classifications for waste. Under federal regulations, waste with a concentration below 50-ppm PCB may be defined as non-PCB waste; whereas, under state regulations waste must have a concentration below 5-ppm PCB to be defined as non-PCB waste.

## Identifying PCB Materials

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There are over 200 PCB isomers and compounds, which vary from mobile, oily liquids to white, crystalline solids and hard resins.

PCBs are difficult to distinguish without using analytical methods. Field screening techniques can test for the presence of chlorine, but laboratory analysis is necessary to identify PCBs and PCB concentrations. The difficulty in identifying PCBs emphasizes the importance of properly labeling equipment and materials that contain them.

PCB materials are divided into two main groups within the regulations: PCBs and PCB Items. PCB Items are further divided into four categories: (1) PCB Articles, (2) PCB Containers, (3) PCB-Article Containers, and (4) PCB Equipment. See the PCB identification chart (**Figure 1**) and the **Glossary** for definitions of these terms.

Contact your Environmental Analyst about any suspected PCB material so that it can be thoroughly evaluated.

## Where PCBs Are Found

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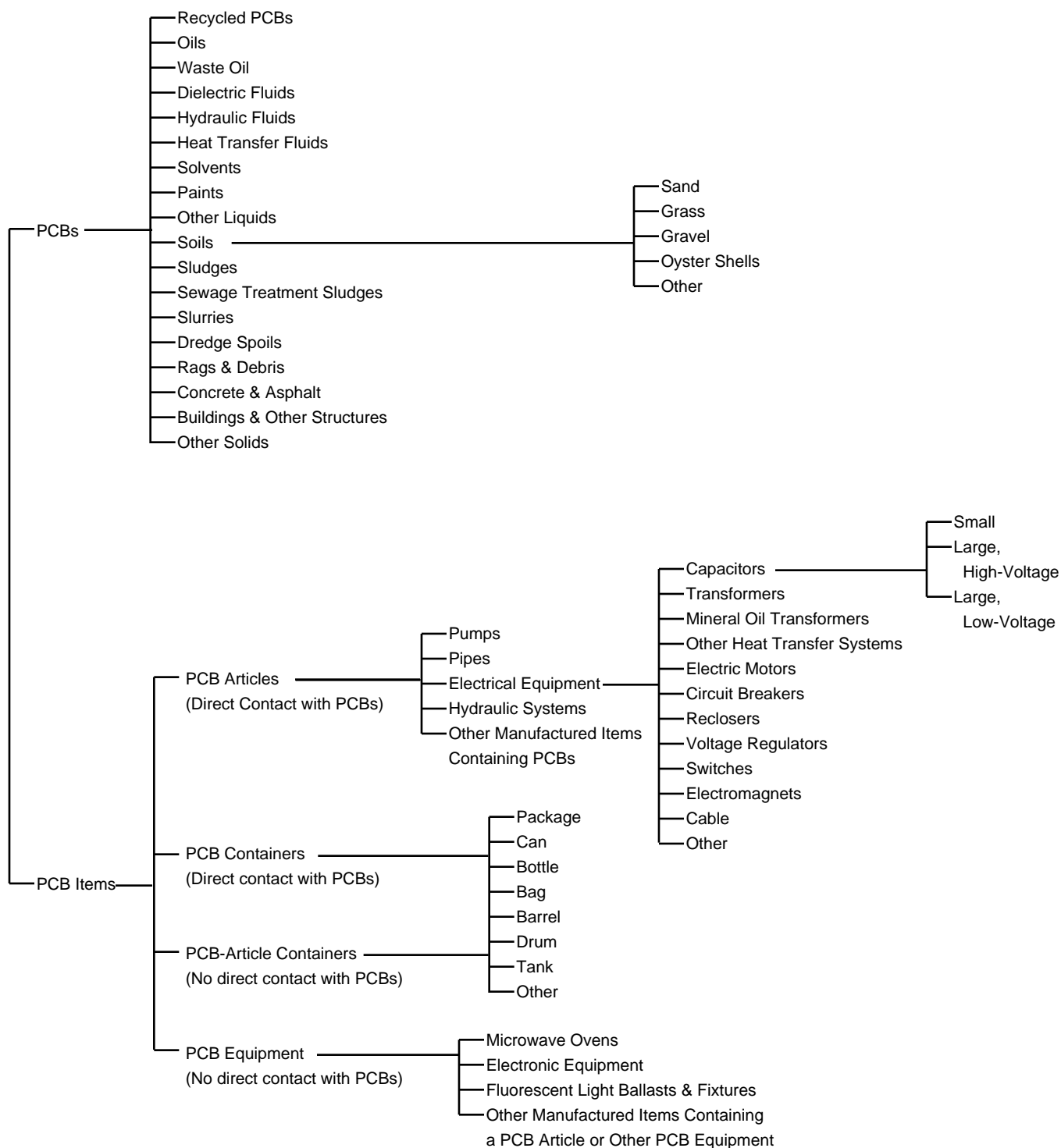
Before federal regulations limited PCB production and use, PCBs were commonly used in a variety of commercial products, including:

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Adhesives</li><li>• Transformers</li><li>• Large, high- and low-voltage capacitors</li><li>• Liquid-cooled electric motors</li><li>• Hydraulic systems</li><li>• Heat-transfer systems</li><li>• Fluorescent light ballasts</li><li>• Electromagnets</li><li>• Liquid-filled cable</li><li>• Gasketing and dampening felt</li></ul> | <ul style="list-style-type: none"><li>• Microscopy mounting media and immersion oil</li><li>• Switches</li><li>• Voltage regulators</li><li>• Vacuum pumps</li><li>• Microwave ovens</li><li>• Electronic equipment.</li></ul> |
|---|--|

Many of the past uses are now unauthorized under federal and state regulations. PCB use is allowed only under specific conditions in limited scenarios.

**NOTE:** PCBs were widely used in equipment that is still in service today; therefore, waste oil collected from this equipment frequently contains a detectable PCB concentration.





(Source: U. S. Department of Energy, *Management of PCBs*, 1993.)

**Figure 1. PCB Identification Chart Based on Regulatory Definitions in TSCA (40 CFR 761).**

# Labeling and Handling PCBs

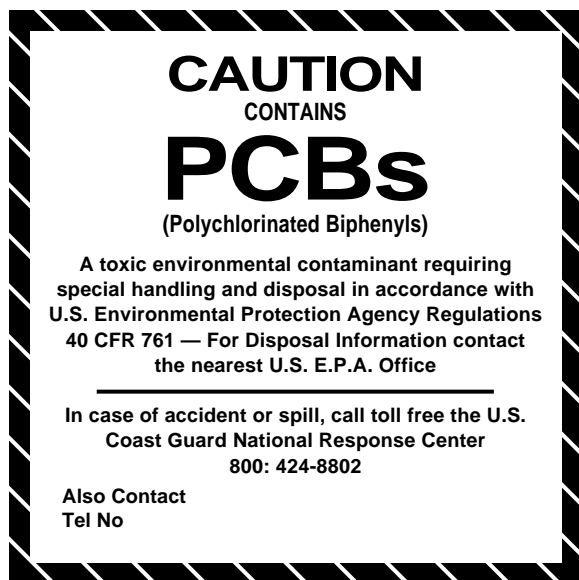
## Labeling Requirements

The following items must be identified and labeled with their PCB classification:

- PCB Containers
- PCB Transformers
- Large, high- and low-voltage PCB Capacitors when they are removed from service
- Electric motors using PCB coolant
- PCB hydraulic systems
- PCB heat-transfer systems
- PCB-Article Containers
- PCB storage areas
- PCB transport vehicles.

If items were not originally labeled by their manufacturer, the owner must label items that may contain PCBs.

Standard PCB labels are square and come in 1-in. increments from 2 in. × 2 in. to 6 in. × 6 in. (see **Figure 2**).

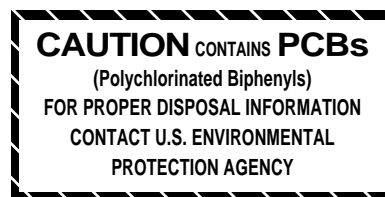


**Figure 2. Standard PCB Label**

If the standard PCB label is too large to fit on a piece of equipment, a 1-in. × 2-in. PCB label may be substituted (see **Figure 3**).

When analytical results identify an item's PCB concentration, the concentration should be written in permanent ink on the label. When the equipment is determined to have a concentration of less than 5-ppm PCBs, a

"Non-PCB" label should be affixed to the equipment. Labeling is also required for materials that do not contain PCBs. Large, low-voltage capacitors; small capacitors that are normally used in alternating circuits; and fluorescent light ballasts that do not contain any concentration of PCBs should be marked "No PCBs" by the manufacturer if manufactured after July 1, 1978.



**Figure 3. 1-in. × 2-in. PCB Label**

Once a PCB Item is removed from service, the PCB Article or Container should also be labeled with the date that it was removed from service. In addition, other regulatory labeling requirements apply depending upon the contents of the container. See **Appendix D** for details.

Standard PCB, no PCBs, and non-PCB labels are available through LLNL Central Supply and Distribution (Central Supply).

**CAUTION:** Aged labels on electrical equipment may not accurately represent the PCB concentration of the equipment's contents. For example, sealed transformers labeled as containing non-PCB oil may become contaminated with PCBs during servicing. Other reasons for erroneous labeling include:

- Improper sampling and/or analysis at the time of original labeling
- Equipment alterations that may have caused a change in PCB concentration since the labeling
- Confusion over the difference between the federal and the state definitions of the non-PCB classification.

Hence, electrical equipment, including sealed transformers originally labeled as non-PCB and maintained in service as non-PCB, should be handled cautiously. The equipment must be evaluated for PCBs and proper PCB classification when removed from service.

## Handling Unidentified Equipment

The status of any unlabeled equipment suspected to contain PCBs must be determined through laboratory analysis, and the equipment subsequently labeled. Some items, such as small capacitors, electromagnets, switches, voltage regulators, circuit breakers, and PCB-contaminated Electrical Equipment, do not require identification and labeling as a condition for continued use. However, the PCB status of these items must be determined when the items are taken out of service.

## Handling PCB Equipment

The regulatory requirements for handling PCB Equipment vary according to equipment type. The regulations divide PCB Equipment into several types:

- Transformers
- Capacitors
- Electrical light ballasts
- Electromagnets, switches, and voltage regulators
- Other PCB Equipment.

The specific equipment requirements are described in detail in **Appendix A**. These requirements generally specify the conditions for continued equipment use and the frequency of equipment inspections.

It is important to note that PCB and PCB-contaminated Items stored for use and reuse are regulated as if they were in use.

To comply with federal law, LLNL must maintain and annually update an inventory of all PCB Articles located onsite. LLNL's Environmental Protection Department (EPD) maintains this annual document log. Notify your Environmental Analyst about any newly discovered and unlabeled PCB Equipment for inclusion in this log. **Appendix B** provides more information for EPD on the required recordkeeping.

## Avoiding Radioactive Contamination of PCB Equipment

Users of PCB Equipment must take all precautions necessary to prevent radioactive contamination of PCBs. **Few disposal options exist for radioactive PCBs.**

## Inspecting PCB Equipment

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Owners of specific PCB Equipment at LLNL are responsible for conducting equipment inspections on a regular basis and maintaining equipment inspections logs. The recommended/ required frequency of inspections for PCB and PCB-contaminated Equipment is shown in **Table 1**. Required quarterly inspections may be conducted any time during the three-month period: January-March, April-June, July-September, and October-December, as long as there is a minimum of 30 days between inspections.

When PCB and PCB-contaminated Equipment are inspected, proper labeling requirements should be checked. Look for indications that the equipment may be leaking, such as:

- Oil stains near the equipment
- Weep marks on the equipment
- Gross physical damage.

These visual inspections do not require much time or effort, but an inspection log must be maintained to document the inspections. At a minimum, the inspection log should contain the date and time of inspection, the name of the inspector, and any findings. The findings must be followed by the corrective actions taken and the date the remedial actions were completed. The inspector must initial or sign all log entries. Records of these inspections must be retained for at least three years after disposing of the PCB-containing Equipment.

**Table 1. Inspection Frequency**

<b>Equipment Description</b>	<b>Inspection Frequency</b>
PCB Transformers	Required quarterly
PCB-contaminated Transformers	Recommended quarterly
PCB Capacitors	Recommended annually
PCB electromagnets, switches, and voltage regulators	Required weekly when near food or feed; otherwise recommended quarterly
PCB-contaminated electromagnets, switches, and voltage regulators	Recommended quarterly
Large PCB Capacitors stored for disposal	Required weekly
PCB Containers and Articles stored for disposal	Required monthly

## Spill Response

Upon discovery of a small spill of PCBs in a given area, employees can usually clean up the spill safely; however, they must be trained in advance to handle these cleanups. Cleanup of the released PCBs must be initiated as soon as possible, but no later than 48 hours after its discovery. Materials for the cleanup of common chemical spills are available from Central Supply.

If the spill is too large to clean up safely or if employees have been injured or contaminated, immediately call the Laboratory emergency number (911 or ext. 2-7333 at the Livermore site; or 911 or ext. 3-5333 at Site 300). The LLNL Fire Department operates a “Haz Mat” (hazardous

material) truck to respond to major spills. Access to the spill area must be controlled to prevent accidental exposure of passersby.

Environmental regulations and U. S. Department of Energy (DOE) Orders have notification and reporting requirements for PCB spills above certain amounts or when potential harm to individuals, property, or the environment exists. Report all spills of PCBs to the Health and Safety (H&S) Technician and your Environmental Analyst. Guidance for EPD and Programs personnel on spill cleanup and reporting information is included in **Appendix C**.

## Disposing of PCB Materials

The disposal of PCB and PCB-contaminated Items must be coordinated through the Hazardous Waste Management (HWM) Division. A PCB or PCB-contaminated Item must be disposed of within one year from the date when the item is declared a waste or is no longer fit for use. PCB and PCB-contaminated Items stored for disposal must be stored in an HWM facility and should be shipped to an approved disposal facility within nine months of removal from service. Temporary storage of certain PCB and PCB-contaminated waste can occur in a Waste Accumulation Area (WAA) for up to 30 days.

Temporary storage of PCB liquid at a concentration of 500 ppm or more is prohibited.

Notify your HWM Technician and Environmental Analyst when PCB and PCB-contaminated Items require disposal. Packaging, labeling, and storage requirements for PCB wastes are provided in **Appendix D** as guidance for the HWM Division. Acceptable disposal options for PCB materials are provided in **Appendix E**.

## Other PCB Uses

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### PCB Research and Development

The research and development of PCB products are prohibited; however, other scientific experimentation or analysis using PCBs is permitted. PCBs may be purchased in hermetically-sealed containers of less than 5 mL. Manufacturing, processing, and distributing PCBs for research and development require a special exemption granted from the EPA.<sup>4</sup>

A laboratory using PCBs for research and development must provide spill containment and the appropriate labels for all PCB materials. PCB waste generated during the research and development activities must be stored and then disposed of properly. Specific recordkeeping and documentation must be maintained. The disposal of PCB and

PCB-contaminated waste must be coordinated through the HWM Division.

All purchases and disposal of PCB materials must be reported to your Environmental Analyst.

### Inadvertent Generation of PCBs

The inadvertent generation of PCBs in a concentration greater than 2 ppm must be reported by LLNL to the EPA<sup>5</sup> within 90 days. PCBs can be produced when chlorine, hydrocarbon, and elevated temperatures (or catalysts) are present together. Please contact your Environmental Analyst in the event of the inadvertent generation of PCBs.

## Recordkeeping Requirements

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PCB regulations require that seven separate types of reports and records be maintained on PCB and PCB-contaminated materials. EPD is responsible for producing the required reports with the exception of equipment inspection logs. PCB Equipment owners are responsible

for conducting equipment inspections and maintaining equipment inspection logs. (Refer to the section, "Inspecting PCB Equipment.") Further information regarding the reports maintained by EPD is given in **Appendix B**.

## Further Assistance on PCB Handling

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Should there be any questions regarding regulatory handling, inspecting, and disposal of PCB and PCB-contaminated Items, please contact your Environmental Analyst.

<sup>4</sup> Only persons granted an exemption under TSCA, Section 6(e)(3)(B) are permitted to manufacture, process, or distribute PCBs in small quantities for research and development.

<sup>5</sup> The reporting requirements for the inadvertent generation of PCBs are detailed in 40 CFR 761.185.



## Glossary of PCB Terminology

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**Anti-dilution Rule**—no provision specifying a PCB concentration may be avoided as a result of any dilution, unless specifically provided (40 CFR 761.1[b]).

**Capacitor**—a device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by a dielectric.

**Dielectric fluid**—a fluid with the electrical conductivity less than a millionth of a mho. Essentially, a dielectric fluid is a fluid which does not conduct electricity.

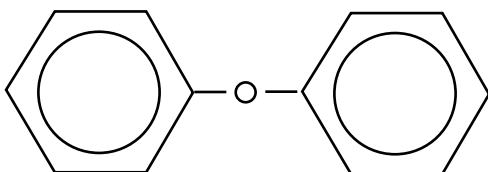
**Fluorescent light ballast**—a device that electrically controls fluorescent light fixtures and that includes a capacitor containing 0.1 kg (0.2 lb) or less of dielectric fluid.

**Large, high-voltage capacitor**—a capacitor containing 1.36 kg (3 lb) or more of dielectric fluid and that operates at or above 2000 V (ac or dc).

**Large, low-voltage capacitor**—a capacitor containing 1.36 kg (3 lb) or more of dielectric fluid and that operates below 2000 V (ac or dc)

**Leak or leaking**—any instance in which a PCB Article, PCB Container, or PCB Equipment has any PCBs on any portion of its external surface.

**PCB**—abbreviation for polychlorinated biphenyl. Includes any chemical substance limited to the biphenyl molecule (see below) that has been chlorinated to varying degrees, or any combination of substances that contain such a substance.



**PCB annual log**—a written log of documents detailing the disposition of PCBs and PCB Items. The annual log includes a summary of the annual records and an inventory of PCB materials. The deadline for compiling the annual log is six months after the end of the calendar year (i.e., July 1). This log shall be retained for at least three years after PCBs are reduced below regulated quantities.

**PCB annual records**—includes all documentation relative to the acquisition or disposal of PCBs over a 12-month period. This documentation includes purchase orders, manifests, certificates of disposal, and inadvertent generation reports. Annual records must be maintained for the same period as the annual log.

**PCB Article**—any manufactured article, other than a PCB Container, that contains PCBs and whose surfaces have been in direct contact with PCBs. It includes capacitors, transformers, electric motors, pumps, pipes, and any other manufactured item (1) that is formed to a specific shape or design during manufacture, (2) whose end-use function is dependent in whole or in part on its shape or design during end use, and (3) that has experienced either no change of chemical composition during its end use or only those changes of composition that have no commercial purpose separate from that of the PCB Article.

**PCB-Article Container**—any package, can, bottle, bag, barrel, drum, tank, or other device used to contain PCB Articles or PCB Equipment and whose surfaces have not been in direct contact with PCBs.

**PCB Container**—any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB Articles and whose surfaces have been in direct contact with PCBs.

**PCB-contaminated**—any substance or material containing between 5- and 500-ppm PCB. Toxic Substances Control Act regulations for PCB-contaminated materials apply to materials containing between 50- and 500-ppm PCBs. For waste disposal, the state of California hazardous waste regulations apply to all materials containing more than 5-ppm PCBs.

**PCB Electrical Equipment**—any electrical equipment that contains PCBs, including, but not limited to, transformers, capacitors, circuit breakers, reclosers, voltage regulators, switches, electromagnets, and cable.

**PCB Equipment**—any manufactured item, other than a PCB Container or a PCB-Article Container, that contains a PCB Article or other PCB Equipment.

PCB Item—any PCB Article, PCB-Article Container, PCB Container, or PCB Equipment that deliberately or unintentionally contains or has as part of it any PCB or PCBs.

PCB Transformer—any transformer that contains 500-ppm PCBs or more.

PCB waste—For purposes of this guidance, any PCB or PCB Item that is no longer in use or stored for use or reuse.

ppm—parts per million by weight. Unit of concentration of PCBs expressed as milligrams per kilogram (mg/kg).

Small capacitor—a capacitor containing less than 1.36 kg (3 lb) of dielectric fluid. When the amount of dielectric fluid is not known, the following capacitors can be assumed to be small: (1) capacitors whose total volume is less than 1639 cm<sup>3</sup> and (2) capacitors with a total volume between 1639 and 3278 cm<sup>3</sup> and a total weight of less than 4.08 kg (9 lb).



## Acronyms

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<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act of 1980	<b>OSHA</b>	Occupational Safety and Health Administration
<b>CFR</b>	Code of Federal Regulations	<b>PCB</b>	Polychlorinated biphenyl
<b>DOE</b>	U. S. Department of Energy	<b>POP</b>	Performance Oriented Packaging
<b>DOT</b>	U. S. Department of Transportation	<b>PRAG</b>	Permits and Regulatory Affairs Group
<b>EDO</b>	Environmental Duty Officer	<b>RCRA</b>	Resource Conservation and Recovery Act
<b>EPA</b>	U. S. Environmental Protection Agency	<b>ROD</b>	Record of Decision
<b>EPD</b>	Environmental Protection Department	<b>RWQCB</b>	Regional Water Quality Control Board
<b>H&amp;S</b>	Health and Safety	<b>SF</b>	San Francisco
<b>HWM</b>	Hazardous Waste Management	<b>SPCC</b>	Spill Prevention Control and Countermeasures
<b>HM181</b>	Hazardous Material 181	<b>TSCA</b>	Toxic Substances Control Act of 1976
<b>HMTA</b>	Hazardous Material Transportation Act	<b>TTO</b>	Total Toxic Organic
<b>LLNL</b>	Lawrence Livermore National Laboratory	<b>UC</b>	University of California
<b>OES</b>	Office of Emergency Services	<b>WAA</b>	Waste Accumulation Area
<b>ORAD</b>	Operations and Regulatory Affairs Division	<b>WDR</b>	Waste Disposal Requisition



## References

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*California Code of Regulations*, Title 22, Part 66261, Chapter 11, “Identification and Listing of Hazardous Waste.”

*California Health and Safety Code*, Division 20, Chapter 6.5, Hazardous Waste Control Law.

*California Health and Safety Code*, Division 20, Chapter 6.6, Safe Drinking Water and Toxics Enforcement Act.

*Code of Federal Regulations*, Title 29, Part 1910, “Occupational Safety and Health Standards,” (29 CFR 1910).

*Code of Federal Regulations*, Title 40, Part 112, “Oil Pollution Prevention,” (40 CFR 112).

*Code of Federal Regulations*, Title 40, Part 761, “Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions,” (40 CFR 761).

*Code of Federal Regulations*, Title 49, Part 178, “Shipping Container Specifications,” (49 CFR 178).

15 United States Code, Section 2601 et seq., Toxic Substances Control Act (TSCA) of 1976.

U. S. Department of Energy (1993), *Environmental Guidance, Management of Polychlorinated Biphenyls*, U. S. Department of Energy, Office of Environmental Guidance, RCRA/CERCLA Division, November (EH-231).

U. S. Department of Energy (1993), “Occurrence Reporting and Processing of Operations Information,” U. S. Department of Energy, Washington, D.C. (DOE Order 5000.3B).



# Appendix A

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## Specific Requirements for PCB and PCB-Contaminated Equipment

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### Transformers

Most transformers containing polychlorinated biphenyls (PCBs) may continue to be used for their remaining useful (active) or normal lives. There are, however, a number of exceptions where PCB Transformers (containing 500 ppm or more PCBs) are prohibited:

- The use or storage of PCB Transformers is prohibited in any location where human food or animal feed products could be exposed to PCBs released from the Transformer.
- Combustible materials may not be stored within 5 m (16.4 ft) of a PCB-Transformer enclosure.
- Use of higher, secondary-voltage (480 V or greater), network PCB Transformers in or near commercial buildings is prohibited. Existing transformers may be reclassified.
- Higher, secondary-voltage (480 V or greater), radial PCB Transformers used in or near commercial buildings must be equipped with electrical protection to avoid transformer ruptures caused by high-current faults and those caused by sustained, low-current faults.
- Lower, secondary-voltage (less than 480 V), network PCB Transformers that are not located in sidewalk vaults must be equipped with electrical protection to avoid transformer ruptures caused by high-current faults, or they must be removed from service. These Transformers must also be registered in writing with the Regional Administrator of the U. S. Environmental Protection Agency (EPA).
- Lower, secondary-voltage (less than 480 V), network PCB Transformers that are located in sidewalk vaults near commercial buildings must be removed from service.
- All lower, secondary-voltage (less than 480 V), radial PCB Transformers must be equipped with electrical protection to avoid transformer ruptures from sustained, high-current faults.

Servicing of PCB Transformers is allowed with a dielectric fluid at any concentration. However, a PCB Transformer should not be serviced when the coil must be removed. This transformer should be disposed of properly.

PCB Transformers must be visually inspected quarterly for leaks. These visual inspections may occur any time during the periods of January to March, April to June, July to September, and October to December, as long as there are at least 30 days between inspections. More frequent inspections (monthly) are recommended. The PCB Transformer owner is responsible for maintaining records of these inspections.

No routine, visual inspections are required for PCB-contaminated Transformers, but it is recommended that these transformers be visually inspected quarterly for leaks.

All leaking transformers must be repaired immediately, or the transformer must be replaced. A leak must be cleaned up within 48 hours after its discovery. All active leaks must be contained in a drip-pan or by some other appropriate method. Daily inspections are required until the leak is repaired.

If a PCB Transformer is involved in a fire-related incident, the National Response Center must be notified through proper LLNL channels, and specific reporting and containment requirements implemented.

### Capacitors

Large PCB Capacitors (containing 1.36 kg or more of dielectric fluid) that are located in restricted areas (either a restricted-access electrical substation or a contained and restricted-access indoor installation) may continue to be used for their remaining lives. Large PCB Capacitors that are not located in restricted areas are prohibited. All small capacitors may continue to be used for their remaining lives.

No routine inspection requirements apply to capacitors unless they are stored for disposal, but it is good practice to inspect them annually for leaks.

Most capacitors cannot be sampled for analysis of PCB concentration. In most cases, the presence of PCBs can be determined directly from information on the capacitor or from the manufacturer.<sup>1</sup> The Environmental Analyst can assist in this identification.

## **Electrical Light Ballasts**

The EPA allows continued use of non-leaking PCB and PCB-contaminated fluorescent light ballasts. When these ballasts are taken out of service, they must be disposed of properly as hazardous waste and are not to be sold to subsequent users.

## **Electromagnets, Switches, and Voltage Regulators**

Most electromagnets, switches, and voltage regulators containing PCBs may continue to be used for their remaining useful or normal lives. The use or storage of a PCB electromagnet (500 ppm or more) in a location where human food or animal feed could be exposed to PCBs released from the electromagnet is prohibited.

Weekly inspections are required for electromagnets with PCBs if they are in use or stored for reuse and contain between 50 ppm and 500 ppm and pose an exposure risk to food or feed.

No routine visual inspections are required for other PCB or PCB-contaminated (less than 500 ppm) electrical equipment in use or stored for re-use, but it is recommended that this equipment be inspected quarterly for leaks.

## **Other PCB Equipment**

Strict regulations apply to the use of PCBs in equipment which may not be totally enclosed. Examples of such equipment include hydraulic systems, heat-transfer systems, and compressors. Generally, this equipment requires annual testing and fluid replacement to reduce PCB levels to less than 50 ppm. Small quantities of PCBs used in equipment during research or used in optical liquids may have less stringent requirements. Contact your Environmental Analyst for information on applicable regulations.

<sup>1</sup>All capacitors are assumed to contain PCBs unless the label or nameplate information, manufacturer's literature, or chemical analysis states that the capacitor does not contain PCBs.

# Appendix B

## PCB Recordkeeping and Reporting

The polychlorinated biphenyl (PCB) recordkeeping and reporting specifics are presented here as guidance to the Environmental Protection Department (EPD) and the Programs.

Federal regulations require that copies of all PCB records be kept in a central location. At LLNL, the central location for all PCB records is the Environmental Protection Department (EPD). These records are maintained by the Permits and Regulatory Affairs Group (PRAG) of EPD's Operations and Regulatory Affairs Division (ORAD).

**Table B-1. Recordkeeping and Reporting**

Types of records	Regulatory citation (40 CFR)	Responsible LLNL organization
Annual records	761.180(a)(1)	EPD - HWM (copy to ORAD PRAG)
Annual document log	761.180(a)(2)	EPD - ORAD PRAG
Report of PCB manufacturing process	761.187	EPD - ORAD PRAG
PCB waste manifest reports	761.215	EPD - HWM (copy to ORAD PRAG)
Notification of PCB waste activity	761.205(b)	EPD - ORAD PRAG
Spill cleanup records	761.125(c)(5)	EPD - ORAD PRAG
Equipment inspection logs	761.30	Equipment owner

### Annual Records

Annual records are required for any facility that uses or stores at least 45 kg (99.4 lb) of PCBs, or one PCB Transformer, or 50 PCB Capacitors. These records include:

- All signed manifests for PCBs generated by the facility during the calendar year (manifests should be legible)
- All exception reports and one-year exception reports
- All Certificates of Disposal received by the facility during the calendar year.

The annual records must be retained for at least three years after the facility drops below the required reporting quantities.

### Annual Document Log

An annual document log is required for any facility that uses or stores at least 45 kg (99.4 lb) of PCBs, or one PCB Transformer, or 50 PCB Capacitors. The document log includes:

- The calendar year covered by the log; and the name, address, and the U. S. Environmental Protection Agency(EPA) identification number of the facility
- The unique number of every manifest for PCBs generated by the facility during the calendar year
- For all manifested PCB waste, unmanifested PCB storage, and any PCBs or PCB Item received from or shipped to other facilities managed by the U. S.

Department of Energy (DOE) or the University of California (UC):

- A unique identification number (serial number) for each PCB Article, PCB Container and PCB-Article Container
- PCB weight (kg)
- Date removed from service
- Date placed in transport
- Date of disposal, if known
- The total number of PCB Articles, PCB-Article Containers, and PCB Containers disposed of or stored for disposal by specific type. The total weight (kg) of PCBs in PCB Articles, PCB-Article Containers, and bulk PCB waste.
- The total number of PCB Transformers and the total weight (kg) of PCBs contained in transformers that remain in service at the end of the calendar year
- The total number of PCB Capacitors remaining in service at the end of the calendar year
- The total weight (kg) of any PCBs and PCB Items in PCB Containers remaining in service at the end of the calendar year, including the identification of the container contents
- Records of phone calls and other documentation verifying receipt by the designated storage or disposal facility of PCB waste transported by an independent transporter.

## Report of PCB Manufacturing Process

The manufacture of PCBs is prohibited in the United States except for PCBs inadvertently generated under certain conditions. The inadvertent generation of PCBs in a concentration greater than 2 ppm must be reported to the EPA. Additional data must be provided to the EPA whenever:

- The total quantity of PCBs in products leaving the manufacturing site in any calendar year exceeds 0.0025 percent of the site's rated capacity
- The total quantity of PCBs released to the air from the manufacturing process exceeds 4.54 kg (10 lb) in any calendar year
- The total quantity of PCBs released to the water from the manufacturing process exceeds 4.54 kg (10 lb) in any calendar year.

The data submitted shall include all analytical data and corresponding throughput data for PCBs.

## PCB Waste Manifest Exception Reports

A generator of PCB waste who does not receive a copy of the manifest with a handwritten signature from the designated PCB storage or disposal facility within 35 days of the initial shipment date must immediately contact the transporter and/or designated facility to determine the status of the PCB waste. Such contacts must be documented. Copies of the manifests must be included in the PCB annual log.

A generator of PCB waste who does not receive a copy of the manifest with a handwritten signature from the designated PCB storage or disposal facility within 45 days of the initial shipment date must submit an Exception Report to the EPA Regional Administrator, Region IX. The Exception Report must include:

- A legible copy of the manifest
- A cover letter explaining the efforts taken to locate the PCB wastes and the results of those efforts. The cover letter must be signed by the generator or by the generator's authorized representative.

A One-Year Exception Report must be filed by a generator of PCB waste who (1) does not receive a copy of the Certificate of Disposal within 13 months from the date of removal from service, (2) receives a Certificate of Disposal confirming disposal on a date more than one year after the date of removal from service, or (3) stores PCB waste for greater than one year prior to disposal. The only exception to this requirement is if the generator does not transfer the PCB waste to the disposer within nine months from the date of removal from service, as required. The One-Year Exception Report must include:

- A legible copy of the manifest, plus other documentation relevant to the transfer and disposal of the PCB waste
- A cover letter, signed by the submitter (generator) or authorized representative, explaining:
  - Date(s) when the PCBs or PCB Items were removed from service
  - Date(s) when the PCBs or PCB Items were received by the submitter, if applicable
  - Date(s) when the PCBs or PCB Items were transferred to a designated disposal facility
  - Identity of the transporters, storage facilities, and disposal facilities known to be involved with the transaction
  - Reason, if known, for the delay in bringing about the disposal of the PCBs within one year from the date of removal from service.



## Notification of PCB Waste Activity

LLNL filed a Form 7710-53 with the EPA in March 1990. No further action is required at this time.

## PCB Spill Cleanup Records

Records documenting the cleanup of spills with high concentrations (500 ppm or greater PCBs) or more than 454 g (1 lb) of PCBs shall be maintained for five years. The records and certification shall consist of the following:

- Identification of the source (e.g., type of equipment) of the spill
- Estimated or actual date and time that the spill occurred
- Date and time that cleanup was completed or terminated (or the nature and duration of the delay if cleanup was delayed by an emergency or adverse weather)
- A brief description of the spill location and the nature of the material contaminated, including whether the spill occurred in an outdoor electrical substation, other restricted access location, or non-restricted access area

- Pre-cleanup sampling data used to establish the spill boundaries, if required because of insufficient visible traces, and a brief description of the sampling methodology used to establish them
- A brief description of the solid surfaces cleaned
- The approximate depth of soil excavation and the amount of soil removed
- Post-cleanup verification sampling data, a brief description of the sampling methodology, and the analytical technique used
- The estimated cost of cleanup (not required).

## Equipment Inspection Logs

Records of the legally required inspections and maintenance history of PCB Equipment, including the name of the person responsible for the inspections and the dates of inspection, must be maintained for at least three years after disposal.



# Appendix C

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## PCB Spill Cleanup and Reporting Requirements (40 CFR 761.120–135)

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**Polychlorinated biphenyls (PCB) spill cleanup and reporting requirements are presented here as guidance to the Environmental Protection Department (EPD) and the Programs. Spills of PCB materials can only be remediated by personnel trained to handle PCB cleanups. Report all spills of PCBs to your Health and Safety Technician and your Environmental Analyst.**

When spills with low concentrations (less than 500 ppm PCBs) and less than 454 g (1 lb) of PCBs occur, all soil within the spill area (visible boundary plus a 1-lateral-ft buffer zone) must be excavated and backfilled with clean soil. Solid surfaces must be double washed/rinsed.<sup>1</sup> This action must be completed within 48 hours after the responsible party was notified or became aware of the spill.

When spills with high concentrations (500 ppm or more PCBs) or more than 454 g (1 lb) of PCBs occur, the National Response Center must be notified immediately. The spill area must be cordoned off with at least a 3-ft buffer zone. Warning signs must be clearly visible. The responsible party must document and record the area of visible contamination, noting the extent and center of the visible trace areas. The cleanup of fluid from hard surfaces and the removal of contaminated soil must be initiated (not necessarily completed) within 24 hours after the responsible party was notified or became aware of the spill. If the spill will result in PCB exposure outside the facility, other spill reporting procedures may be required.

The U. S. Environmental Protection Agency (EPA), Region IX, regards soil, asphalt, wood, cement, and concrete as porous materials that absorb PCBs. Where practicable, these materials must be removed when they are within the spill area. The spill boundary must be verified by sampling and analysis. Solid, impenetrable surfaces (e.g., metals and impervious liners) may be decontaminated by a double wash/rinse. All decontamination must be verified by sampling and analysis, using bulk samples for porous materials and wipe samples for impenetrable surfaces.

All concentrated soils, solvents, rags, and other materials resulting from the cleanup of PCBs must be properly stored, labeled, and disposed of as PCB or PCB-contaminated materials. The containers of PCB wastes generated must be free of PCB contamination on all outside surfaces.

The PCB Spill Cleanup Policy for the EPA, Region IX, requires soils to be remediated to background levels (i.e., detection limits), where practicably attainable, of any PCB spill from a source greater than 50-ppm PCBs. In certain cases, the EPA, Region IX, will consider alternative cleanup levels. Cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 allows deviation from the Regional Policy when the reason for deviation is included in the Record of Decision (ROD). The ROD should have the concurrences of the EPA Pesticides and Toxics Branch Chief and the Toxics and Waste Management Division Director.

Spill reports (both verbal and written) must be completed only by the EPD personnel and are required to contain the following information:

- Nature of waste or pollutant (i.e., PCB)
- Quantity of waste or pollutant involved
- Time and duration of the incident
- Cause of the spill
- Estimated size and location of the affected area
- Nature of effects (e.g., fish kill, toxic cloud, discoloration of receiving water)
- Corrective measures taken or planned, and a schedule of these activities
- Spill Prevention Control and Countermeasures (SPCC), and/or contingency plans, in effect
- Persons notified (include name, organization, date, and times).

<sup>1</sup> Double wash/rinse means a minimum requirement to cleanse solid surfaces two times with an appropriate cleaning agent. PCBs must be at least 5-percent soluble by weight in the cleaning agent. A volume of PCB-free fluid sufficient to cover the contaminated surface completely must be used in each wash/rinse. The wash/rinse requirement does not mean the mere spreading of the cleaning agent over the surface, nor does the requirement mean a once-over wipe with a soaked cloth.

A number of agencies are potentially interested in spills of PCBs depending on the spill concentration, quantity, and location. Spill reports must be reported by EPD as soon as possible and

within the 24-hour legal requirement. **Table C-1** summarizes the reporting requirements and notes where written reports are also required.

**Table C-1. PCB Spill Notification Requirements for EPD**

Agency	Phone Number	Conditions	Regulatory Authority
<b>National Response Center</b>	1-800-424-8802	Spills involving 454 g (1 lb) or more of PCBs to the environment	CERCLA 40 CFR 302 Clean Water Act 40 CFR 117.3
<b>U.S. Coast Guard</b>	(510) 437-3781	Concentrations greater than 5 ppm for liquids and 50 ppm for solids to the waters and/or soils of the state	Board WDR 90-106
<b>Environmental Protection Agency (EPA), Region IX, Office of Pesticide and Toxic Substances Branch</b>	(415) 556-5395	Concentration greater than 50 ppm and spills involving 4.54 kg (10 lb) or more of PCBs, or discharge to water or agricultural land	TSCA 40 CFR 761
<b>Department of Energy (DOE)</b>	Notify via the LLNL Environmental Duty Officer (EDO)	Occurrence that requires notification of regulatory agencies	DOE Order 5000.3A
<b>California Office of Emergency Services (OES)</b>	1-800-852-7550	Spills involving 454 g (1 lb) or more of PCBs to the environment	
<b>Regional Water Quality Control Board (RWQCB), SF Bay Region<sup>a</sup></b>	8 am - 5 pm (510) 464-1255 After hours, call OES and U.S. Coast Guard	Concentrations greater than 5 ppm for liquids and 50 ppm for solids to the waters and/or soils of the state	Standard conditions Board Order 90-106
<b>Regional Water Quality Control Board (RWQCB), Central Valley Region<sup>a</sup></b>	8 am - 5 pm (916) 361-5600 After hours, call OES and U.S. Coast Guard	Concentrations greater than 5 ppm for liquids and 50 ppm for solids to the waters and/or soils of the state	Standard conditions Board Order 91-082
<b>Livermore Water Reclamation Plant<sup>a</sup></b>	(510) 373-5230	Concentrations exceeding 0.01 mg/l TTO <sup>b</sup> to sanitary sewer at LLNL Main Site	Wastewater Discharge Permit #1250-(91-92)

<sup>a</sup> Written report also required within five working days.

<sup>b</sup> TTO - Total Toxic Organic compound concentration.

# Appendix D

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## Waste PCB Packaging, Labeling, and Storage (40 CFR 761.65)

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**The waste polychlorinated biphenyls (PCB) packaging and storage requirements are here only as guidance for the Environmental Protection Department and the Programs.**

### Packaging

Toxic Substances Control Act (TSCA) regulations defer to U. S. Department of Transportation (DOT) requirements for container specifications. Packaging PCBs vary on the type of PCB and mode of transportation. New U. S. Department of Energy (DOE) Performance Oriented Packaging (POP) will be effective after September 1996.

Until September 1996, acceptable containers for the storage and transportation of liquid PCBs include:

- Specification 5 containers without removable head (49 Code of Federal Regulations [CFR] 178.80)
- Specification 5B containers without removable head (49 CFR 178.82)
- Specification 6D overpack (49 CFR 178.102) with Specification 2S (49 CFR 178.35) or 2SL (49 CFR 178.35a) polyethylene containers
- Specification 17E containers (49 CFR 178.116)
- Containers larger than specified in DOT specifications 5, 5B, 6D, or 17E, if the containers are designed, constructed, and operated in compliance with Occupational Safety and Health Agency standards, 29 CFR 1910.106; and the design is reviewed to assure the structural safety of the container when placing liquids with the specific gravity of PCBs into the containers. Storage of PCBs in these containers requires the preparation and implementation of a Spill Prevention, Control, and Countermeasures (SPCC) plan as described in 40 CFR 112.

Until September 1996, acceptable containers for the storage and transportation of non-liquid PCBs include:

- Specification 5 containers (49 CFR 178.80)
- Specification 5B containers (49 CFR 178.82)

- Specification 17C containers (49 CFR 178.115)
- Containers larger than specified in DOT specifications 5, 5B, or 17C, if the containers are designed and constructed in a manner that will provide as much protection against leaking and exposure to the environment as the DOT-specification containers.

The container must be sealed, and the sides and top of the container must be free of PCB contamination. The appropriate, standard PCB label must be affixed to the outside of the container. In addition, the container must conform to packaging requirements covered in the course, EP0006, "Hazardous Waste Generation and Certification." The Waste Disposal Requisition (WDR) procedure is required to initiate the waste management process.

### PCB Labeling

PCB Items, PCB storage areas, and PCB transport vehicles must be clearly marked with the appropriate labels indicating the presence of PCBs. The large PCB label is most often required by the regulations. A smaller label is also available for smaller items. The label must be placed in a position clearly visible by any person servicing or inspecting the item, storage area, or transport vehicle. If PCB Items are discovered that are not labeled, they must be labeled as soon as possible. Labels are available through Central Supply. In addition to PCB labels and the date of removal from service, Resource Conservation and Recovery Act (RCRA), and DOT labeling requirements may be required. Certain PCB wastes will require a manifest and a proper DOT shipping name and container. The U. S. Environmental Protection Agency (EPA), DOT, and California regulations should be consulted for proper labeling instructions.

### PCB Storage in Waste Accumulation Areas

The following items may be stored in Waste Accumulation Areas (WAAs) for up to 30 days from the date of their removal from service, provided that a notation

is attached to the PCB Item or PCB Container indicating the date that the item was removed from service:

- Non-leaking PCB Articles and PCB Equipment
- Leaking PCB Articles and PCB Equipment, if the PCB Items are placed in a non-leaking PCB Container that contains sufficient sorbent materials to absorb any liquid PCBs remaining in the PCB Item
- PCB Containers containing non-liquid PCBs, such as contaminated soils, rags, and debris
- PCB Containers containing PCBs at a concentration between 50 and 500 ppm, provided a SPCC Plan has been prepared for the WAA in accordance with 40 CFR 112. In addition, each container must bear a notation indicating that the liquids in the container do not exceed 500-ppm PCB.

PCB Containers that have PCBs at a concentration less than 50 ppm may be stored in WAAs for up to 90 days from the date of their removal from service. A notation must be attached to the PCB Item or PCB Container indicating the date that the item was removed from service and that the liquids in the container do not exceed 50-ppm PCBs. PCB-contaminated Electrical Equipment that has been drained of free-flowing dielectric fluid may be stored in WAAs for up to 90 days from the date of their removal from service.

Storage of PCB liquid with a concentration of 500 ppm or more in a WAA is prohibited.

No item or movable equipment that is used for handling PCBs and PCB Items in the WAA and that comes into direct contact with PCBs shall be removed from the storage facility area unless it has been decontaminated by swabbing contaminated surfaces that have contacted PCBs with a cleaning agent. The cleaning agent must contain less than 50-ppm PCBs, and the solubility of PCBs in the cleaning agent must be more than 5-percent weight.

All PCB Articles and PCB Containers stored in the WAA must be visually checked for leaks at least once every 30 days.

## One-Year Storage Requirements

PCB Articles and PCB Containers can be stored at a permitted storage facility for up to one year from the date they were first placed in storage before disposal but should be shipped to an approved disposal facility within nine

months of removal from service. The facility must operate under either a California hazardous waste permit or interim status document. Facilities used to store PCBs must meet the following criteria:

- Roof and walls must be adequate to prevent rain water from reaching the stored PCBs and PCB Items.
- The floor must have continuous curbing with a minimum 6-in.-high curb. The floor and curbing must provide a containment volume equal to at least two times the internal volume of the largest PCB Article or PCB Container being stored, or 25 percent of the total internal volume of all PCB Articles and PCB Containers being stored, whichever is greater.
- No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from the curbed area are permitted.
- The floors and curbing must be constructed of continuous, smooth, and impervious materials to prevent or minimize penetration of PCBs.
- The facility cannot be located below the 100-year flood water elevation.

No item or movable equipment that is used for handling PCBs and PCB Items in the storage facilities and that comes into direct contact with PCBs shall be removed from the storage facility area unless it has been decontaminated by swabbing contaminated surfaces that have contacted PCBs. The cleaning agent must contain less than 50-ppm PCBs, and the solubility of PCBs in the cleaning agent must be more than 5-percent weight.

All PCB Articles and PCB Containers in storage must be visually checked for leaks at least once every 30 days.

PCB-contaminated Electrical Equipment and large, high-voltage PCB Capacitors that are non-leaking and structurally undamaged and that have not been drained of free-flowing dielectric fluid, may be stored on pallets next to the permitted storage facility. This storage outside the facility is only allowed when the immediately available, unfilled space in the storage facility is less than 10 percent of the volume of the capacitors and equipment stored outside the facility. The capacitors and equipment temporarily stored outside the facility must be checked weekly for leaks.

# Appendix E

## PCB Disposal (40 CFR 761.60)

Polychlorinated biphenyls (PCB) disposal requirements are presented here as guidance to the Hazardous Waste Management (HWM) Division. PCB or PCB-contaminated Items must be disposed of within one year from when the item is declared a waste or is no longer in service. PCB and PCB-contaminated Items

stored for disposal must be stored in a Toxic Substances Control Act (TSCA)-approved storage area and should be shipped to an approved disposal facility within nine months of removal from service. The disposal options for bulk PCBs and PCB Articles are given in the following tables.

**Table E-1. Disposal Methods for Bulk PCBs**

Types of Bulk PCBs	Appropriate Disposal Method(s)
1. Mineral oil dielectric fluids ( $\geq 500$ ppm)	Incineration
2. Mineral oil dielectric fluids ( $\geq 5$ ppm and $< 500$ ppm)	Incineration Out-of-state chemical landfill (except ignitable waste) High-efficiency boiler Other approved disposal facility
3. Waste oil <sup>a</sup> ( $> 2$ ppm and $< 50$ ppm)	Incineration Other approved disposal facility
4. Other liquid materials ( $\geq 500$ ppm)	Incineration
5. Other liquid materials ( $\geq 50$ ppm and $< 500$ ppm)	Incineration High-efficiency boiler
6. Other liquid materials ( $\geq 5$ ppm and $< 50$ ppm)	Incineration Out-of-state chemical landfill (except ignitable waste) High-efficiency boiler Other approved disposal facility
7. Non-liquid PCBs ( $\geq 50$ ppm)	Incineration Chemical landfill
8. Dredged materials and sewage sludge ( $\leq 50$ ppm)	Incineration Chemical landfill Other approved disposal method

<sup>a</sup> Waste oil may be burned or marketed only for energy recovery purposes.

**Table E-2. Disposal Methods For PCB Articles**

<b>Types of PCB Articles</b>	<b>Appropriate Disposal Method(s)</b>
1. PCB Transformers	Incineration Chemical landfill (after draining, flushing, and filling with absorbent)
2. Small PCB Capacitors <sup>a</sup>	Incineration Chemical landfill in a labpack
3. Large PCB Capacitors <sup>a</sup>	Incineration
4. PCB hydraulic machines (≥1000 ppm)	Municipal solid waste facility or salvage (after draining and flushing)
5. PCB hydraulic machines (<1000 ppm)	Municipal solid waste facility or salvage (after draining)
6. PCB-contaminated Electrical Equipment	Incineration Chemical landfill in a labpack
7. Other PCB Articles (≥500 ppm)	Incineration Chemical landfill after draining
8. Other PCB Articles (<500 ppm)	Nonregulated after draining
9. PCB Container	Incineration Chemical landfill after draining

<sup>a</sup> The definitions for small and large capacitors are detailed in 40 CFR 761.3.

### **PCB Material Mixed with RCRA Hazardous Waste**

Where PCBs or PCB Items are mixed with, contained in, or contaminated with Resource Conservation and Recovery Act (RCRA) hazardous waste, disposal may also be subject to the RCRA land disposal restrictions.

### **PCB Material Mixed with Radioactive Waste**

PCB or PCB Items that are contaminated with radioactive constituents are regulated by the Atomic Energy Act and applicable U. S. Department of Energy (DOE) Orders as well as TSCA; therefore, disposal may also be subject to stricter requirements.





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